

Mieczysław GRZELAK<sup>1</sup>, Danuta MACKIEWICZ<sup>2</sup>, Maciej MURAWSKI<sup>1</sup>, Sławomir JANYSZEK<sup>3</sup>,  
Sławomir RUNOWSKI<sup>4</sup>, Agnieszka KNIOLA<sup>1</sup>

The Poznań University of Life Sciences

<sup>1</sup> Department of Grassland and Natural Landscape Sciences,

<sup>2</sup> Department of Genetics and Plant Breeding,

<sup>3</sup> Department of Inland Fisheries and Aquaculture,

<sup>4</sup> Department of Botany

e-mail: grzelak@up.poznan.pl ; grzelakm@o2.pl

## PHYTOCENOSES WITH A CONSIDERABLE SHARE OF *DESCHAMPSIA CAESPITOSA* (L.) P. BEAUV.

### Summary

Basic studies were conducted in the Noteć Bystra valley at the Biała - Radolin – Radolinek section, in the vegetation season in 2012, and supplementary studies, mainly site studies, were conducted in 2014. In terms of the administrative division this area is located in the northern part of the Wielkopolskie province in the Czarnków-Trzcianka county. Analyses were carried out on seventeen phytocenoses with a marked dominance of tufted hairgrass (*Deschampsia caespitosa* (L.) P. Beauv.). In the floristic composition native species were predominant, accounting for 92.72%, of which 70.91% were apophytes and 21.81% - spontaneophytes. Alien species (kenophytes and archeophytes) were relatively scarce and accounted for 7.28%. Analysed phytocenoses in the plant community are characterized by a medium floristic diversity, defined by the calculated Shannon-Wiener index  $H' = 2.7$ . In turn, the nature value index was 2.16. Fodder value was low, with yields of hay at 3.2 – 4.2 ( $t ha^{-1}$ ) and fodder value score  $Fvs = 3.9$ .

**Key words:** tufted hairgrass, Noteć River valley, fodder value, floristic diversity, nature value

## FITOCENOZY ZE ZNACZĄCYM UDZIAŁEM *DESCHAMPSIA CAESPITOSA* (L.) P. BEAUV.

### Streszczenie

Badania zasadnicze przeprowadzono w dolinie Noteci Bystrej na odcinku Biała - Radolin – Radolinek, w sezonie wegetacyjnym w 2012, a uzupełniające, głównie siedliskowe, w 2014 r. Pod względem administracyjnym obszar ten jest położony w północnej części województwa wielkopolskiego, w powiecie czarnkowsko-trzcianeckim. Przeanalizowano siedemnaście płatów z widoczną dominacją śmiełka darniowego. (*Deschampsia caespitosa* (L.) P. Beauv.). W składzie florystycznym przeważają gatunki rodzimego pochodzenia, które stanowią 92,72% z czego 70,91% to apofity, a 21,81% - spontaneofity. Gatunki obcego pochodzenia (kenofity i archeofity) występują stosunkowo nielicznie i stanowią 7,28%. Analizowane płaty zbiorowiska odznaczają się średnią różnorodnością florystyczną, którą charakteryzuje obliczony wskaźnik Shannona-Wienera wynoszący  $H' = 2,7$ . Natomiast wskaźnik waloryzacji przyrodniczej wynosi 2,16. Wartość paszowa jest niska, plony siana kształtują się na poziomie 3,2 – 4,2 ( $t ha^{-1}$ ), a wartość użytkowa ( $Lwu = 3,9$ ).

**Słowa kluczowe:** śmiełek darniowy, dolina Noteci, wartość paszowa, różnorodność florystyczna, waloryzacja przyrodnicza

### 1. Introduction

The Noteć River is characterized by a considerable variability of habitat and geomorphological conditions. This results in a high diversity of observed plant communities, including plant communities with a high share of tufted hairgrass [1, 2, 3]. The plant community with tufted hairgrass is common in the Noteć Bystra valley as well as in the Wielkopolska region and entire Poland. Tufted hairgrass is a frequent component of meadow phytocenoses in the Wielkopolska region, showing their low culture and general neglect by their users [4, 5].

This species is most frequently found away from the river on the floodplain and in local depressions [6] as well as periodical drought conditions [1], both on waterlogged acid soils and on swamp, peat-muck soils, less frequently on mineral soils. Meadows with tufted hairgrass are often found in lowland bogs, which have not been properly managed after land reclamation works were completed [5]. Most frequently this plant community is found in neglected pastures [6, 7]. Occasionally it is found on loamy sands [2]. As an endophyte it adapts itself easily to various habitat

types, mainly with the so-called defective soil profile, i.e. with insertions hindering vertical water migration, leading to periodical excess of moisture contents, thus producing anaerobic conditions.

This species is found in plant associations from the classes *Phragmitetea*, *Nardo – Calunetea*, *Scheuchzerio – Caricetea nigrae*, etc. However, it is found in greatest numbers in phytocenoses of the *Molinio-Arrhenatheretea* class [8].

Most commonly its development is a consequence of negligence in management, unregulated and unstable water relations [3, 7, 9]. Usually soils are abundant in nitrogen and have a high pH value.

Areas overgrown with vegetation with a high share of tufted hairgrass are of low productive value and are considered to be semi-fallow meadows, producing only low quality hay [5, 8].

The aim of this study was to conduct floristic and habitat analyses, to determine nature value as well as yielding and fodder value score of plant communities with a considerable share of tufted hairgrass *Deschampsia caespitosa*.

## 2. Material and methods

Floristic studies included:

- preparation of relevés according to Braun-Blanquet in the Noteć Bystra valley in the Biała - Radolin - Radolinek section in thirteen phytocenoses with a marked predominance of tufted hairgrass,
- classification of the meadow plant community to the phytosociological system [10],
- calculation of floristic diversity through the analysis of the species composition, i.e. the botanical structure (in %), the total number of species found in the plant community, the mean number of species in the relevé and calculation of the Shannon-Wiener diversity index:

$$H' = -\sum (p_i \times \log p_i),$$

where:

- $H'$  - the Shannon–Wiener index,  
 $\Sigma$  - number of all species in the plant community,  
 $p_i$  - number of localities of species in relevés,
- assessment of the degree of synanthropisation, i.e. the geo-historical spectrum of species, which makes it possible to determine the degree of vegetation transformations caused by anthropopressure. Individual plant species were assigned to the following categories:
    - Spontaneophytes (Sp) – native species found solely in plant communities independent of human interference,
    - Apophytes (Ap) – native species found in plant communities existing thanks to constant or periodical human intervention,
    - Archeophytes (Ar) – accidentally introduced and which survived in a given area under the influence of human activity in an earlier period (up to the 15th century),
    - Kenophytes (Kn) – species accidentally introduced to a given area under the influence of human activity in the later period (after the 15th century),
  - determination of the nature value index, estimated in nature value and quality classes [11].
  - division of species in plant communities in terms of life forms, i.e. adaptation to specific environmental conditions and vegetation forms in individual plants according to the Raunkiaer system.

Habitat analyses included the assessment of habitat conditions using the ecological index method. This method determines the relationship between individual vascular plant species and the habitat, in which they are found. The following edaphic factors were included in this study:

- [12] - moisture content (F), soil reaction (R) and nitrogen content in soil (N) assessed in a 9- and 12-point scale (covering only moisture conditions – F). The lowest intensity of a given edaphic index is denoted by 1,
- fodder value of plant communities estimated based on the fodder value score Fvs [6].

## 3. Floristic studies

In the Noteć Bystra valley in the Biała - Radolin - Radolinek section thirteen phytocenoses with a marked domination of tufted hairgrass were recorded. These phytocenoses were found on flat floodplains, also in local, shallow land depressions.

The syntaxon *Deschampsia caespitosa* in the investigated area bordered with *Poa pratensis-Festuca rubra*, *Agrostis stolonifera-Potentilla anserina* and *Lolium-Cynosuretum*. As many as 55 plant species were reported

from 40 genera and 17 botanic families, comprising this plant community, of which 32 are species characteristic to syntaxonomic subunits of the class *Molinio-Arrhenatheretea* as well as the class itself. *Deschampsia caespitosa* was the dominant species (S=V, D=3250). Moreover, the dominant role in the structure of the identified plant community is played by *Achillea millefolium* (ChO.Arrhenatheretalia) found in 9 out of 14 phytocenoses (S=IV, D=379) and *Holcus lanatus* – the edificator of the class *Molinio-Arrhenatheretea* (S=IV, D=314). On average a relevé contained 12 species, with their greater number recorded in phytocenoses of lower moisture content. A total of 25 accompanying species were also recorded. All of these species were found at a very low abundance and the lowest (I) stability, with only *Festuca rubra* exhibiting a slightly greater abundance. In the sward the predominant species were from the families *Poaceae*, *Asteraceae*, *Caryophyllaceae* (tab. 1).

Table 1. Quantitative and qualitative presentation of flora in the plant association *Deschampsia caespitosa*

No.	Family	Percentage share in association	Number of genera	Number of species
1	<i>Poaceae</i>	16,36	9	9
2	<i>Cyperaceae</i>	5,45	1	3
3	Herbs and weeds	78,18	$\Sigma = 30$	$\Sigma = 43$
4	<i>Asteraceae</i>	18,18	6	10
5	<i>Caryophyllaceae</i>	10,91	4	6
6	<i>Ranunculaceae</i>	9,09	3	5
7	<i>Caryophyllaceae</i>	9,09	3	5
8	<i>Polygonaceae</i>	9,09	3	5
9	<i>Polygonaceae</i>	5,45	2	3
10	<i>Rosaceae</i>	3,63	2	2
11	<i>Geraniaceae</i>	1,81	1	1
12	<i>Chenopodiaceae</i>	1,81	1	1
13	<i>Boraginaceae</i>	1,81	1	1
14	<i>Lamiaceae</i>	1,81	1	1
15	<i>Plantaginaceae</i>	1,81	1	1
16	<i>Primulaceae</i>	1,81	1	1
17	<i>Lythraceae</i>	1,81	1	1
	$\Sigma = 17$	<b>100</b>	$\Sigma = 40$	$\Sigma = 55$

Source: own work / Źródło: opracowanie własne

In the floristic composition with a considerable share of the *Deschampsia caespitosa* plant community native species predominate, accounting for 92.72%, of which 70.91% are apophytes and 21.81% - spontaneophytes. Alien species (kenophytes and archeophytes) are relatively scarce and account for 7.28% (table 2).

Table 2. The degree of synanthropisation in the *Deschampsia caespitosa* plant community

Genera	Number	Share (%)
Apophytes	39	70.91
Spontaneophytes	12	21.81
Kenophytes	2	3.64
Archeophytes	2	3.64

Source: own work / Źródło: opracowanie własne

The analyzed phytocenoses in the plant community are characterized by a medium floristic diversity, as characterized by the calculated Shannon-Weiner index  $H' = 2.7$ .

In turn, the nature value index is 2.16 (value class IIIA), which indicates low nature value. In terms of life forms ac-

according to Raunkiaer, 60.26% are herbaceous perennials, hemicryptophytes, 24.36% are cryptophytes and 15.38% are annual plants surviving the adverse season in the form of seeds (table 3).

Table 3. Nature value of the *Deschampsia caespitosa* plant community

List	Value
Total number of species in the association	55
Mean number of species in relevé	12
H'	2.72
<b>Structure of life forms according to Raunkiaer (%)</b>	
Hemicryptophytes	60.26
Cryptophytes	24.36
Therophytes	15.38
Nature value index	2.16

Source: own work / Źródło: opracowanie własne

#### 4. Habitat studies

Phytocenoses of the plant community developed in fresh and partly moist habitats, on soils with acid reaction and moderately low nitrogen content (tab. 4).

Table 4. Habitat conditions of identified communities

Index	Value
Soil moisture content - F	6.21
Soil acidity - R	2.15
Soil nitrogen content - N	3.82

Source: own work / Źródło: opracowanie własne

#### 5. Yielding and fodder value

Fodder value of the sward in the plant community is mediocre at Fvs = 3.9. The fodder value of the sward is also reduced due to the presence of poisonous or harmful species.

Table 5. Yield and use value in identified plant communities

Plot no.	Plant community with <i>Deschampsia caespitosa</i>	Yield (t d.m. - DM ha <sup>-1</sup> )	Lwu - Fvs	Number of species of economic value
1.	Plat 1	3.2	2.8	7
2.	Plat 7	4.4	2.9	11
3.	Plat 9	4.1	2.2	9
Mean		3.9	2.6	9

\* Fvs – fodder value score index [6]

Source: own work / Źródło: opracowanie własne

#### 6. Conclusions

1. In the analyzed area phytocenoses with a considerable share of *Deschampsia caespitosa* bordered with *Poa prat-*

*ensis-Festuca rubra, Agrostis stolonifera-Potentilla anserina* and *Lolium-Cynosuretum*.

2. As many as 55 plant species were distinguished from 40 genera and 17 botanical families, comprising this plant community, of which 32 are species characteristic of syn-taxonomic subunits of the class *Molinio-Arrhenatheretea*.

3. The plant community with tufted hairgrass exhibits floristic and habitat variation and the dominant share of tufted hairgrass with a low fodder value results in the very low fodder value of the sward and low yielding.

4. A large share of tufted hairgrass in the sward results in the deterioration of nature value of meadow and pasture plant communities due to the reduction of their floristic diversity and increased synanthropisation.

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